REV B

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DWG. NO. 150-045709

APPLICATION		REVISIONS				
NEXT ASSEMBLY	FINAL ASSEMBLY	REV	DESCRIPTION	DATE	APPROVED	APPROVED
GENERAL		**A**	**Initial Release per DCN W**		**V Wallace**	**---**
		B	**Remove Day VFR; Pilot Guide Revision Change**	**06/12/03**	**M. McCormack**	

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APPROVALS	DATE
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CHELTON FLIGHT SYSTEMS

ROTORCRAFT FLIGHT MANUAL SUPPLEMENT

SIZE	CAGE CODE	DWG NO.	REV
A	1B7G3	150-045709	B

SCALE: NONE **DO NOT SCALE DRAWING**

FAA APPROVED
ROTORCRAFT FLIGHT MANUAL SUPPLEMENT
For
CHELTON FLIGHTLOGIC EFIS as installed in

BELL HELICOPTER MODEL 206 Series

Registration Number _____

Serial Number _____

This Supplement must be attached to the basic FAA Approved Rotorcraft Flight Manual when the aircraft is modified by the installation of the Chelton FlightLogic EFIS in accordance with Supplemental Type Certificate No. SR02209AK.

The information contained herein supplements or supersedes the basic flight manual only in those areas contained herein. For limitation, procedures, and performance data not contained in this supplement, consult the basic flight manual.

FAA Approved: _____
Manager, Anchorage Aircraft Certification Office
Federal Aviation Administration
Anchorage, Alaska
Date: June 12, 2003

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Revision Record

Rev.	Pages	Revision Description	FAA Approval	DATE
A	1-17	Initial Release		May 30, 2003
B	8-9	Revise Pilot Operating Guide Revision Level and Date. Remove Day VFR Restriction		June 12, 2003

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LIST OF ILLUSTRATIONS

GENERAL

The Chelton FlightLogic EFIS integrated display unit (IDU) can be configured as a Primary Flight Display (PFD), or a Multi-Function Display (MFD) depending on installation. The PFD is a perspective view display that provides forward-looking terrain, attitude, altitude, airspeed, vertical speed, direction, and Highway-in-the-Sky navigation. The MFD can display a map with waypoints, fixes, and airfields; terrain, HSI or a combination thereof.

The EFIS provides visual and aural warnings, cautions, and advisories for system monitoring. Warnings consist of a red flag on the IDU and a voice warning that repeats until acknowledged by the pilot by depressing the audio mute switch on the cyclic. Cautions consist of an amber flag on the IDU and a one-time voice report. Advisories are accompanied by a green flag or no flag, depending on condition, and either a single voice report or alert tone.

Each IDU contains all necessary hardware, software, and databases and operate independently of the other IDUs installed. The IDU consists of a high-brightness backlit Active Matrix Liquid Crystal Display screen, eight menu buttons, a selection/enter knob, a display brightness knob, and an optional slip indicator. The buttons, control knobs, and optional slip indicator are backlit and adjustable by the brightness knob.

REMOTE SENSORS

The Crossbow Technologies AHRS500GA AHRS unit provides attitude and heading reference to the EFIS. The AHRS500GA employs three, solid-state angular-rate sensors, three solid-state accelerometers, and three fluxgate magnetometers encased in a single sealed, all-metal housing that is isolated from external shock and vibration

The FreeFlight Systems Wide Area Augmentation System-Global Positioning Sensor (WAAS-GPS) provides GPS data for aircraft, navigation, obstruction, and terrain data in a self contained unit. The WAAS-GPS consists of an antenna mounted on top of the airframe, and a Sensor/Processor Unit (SPU) located remotely in the avionics area.

The Shadin 2000 ADC provides airspeed, altitude, fuel flow, and Outside Air Temperature (OAT) for processing in the EFIS. The ADC is a self-contained remote mounted unit that receives its input from the aircraft's pitot-static system.

A complete description of the functions of the EFIS is contained in the Chelton FlightLogic EFIS Pilot's Operating Guide and Reference, Doc. No. 150-045240.

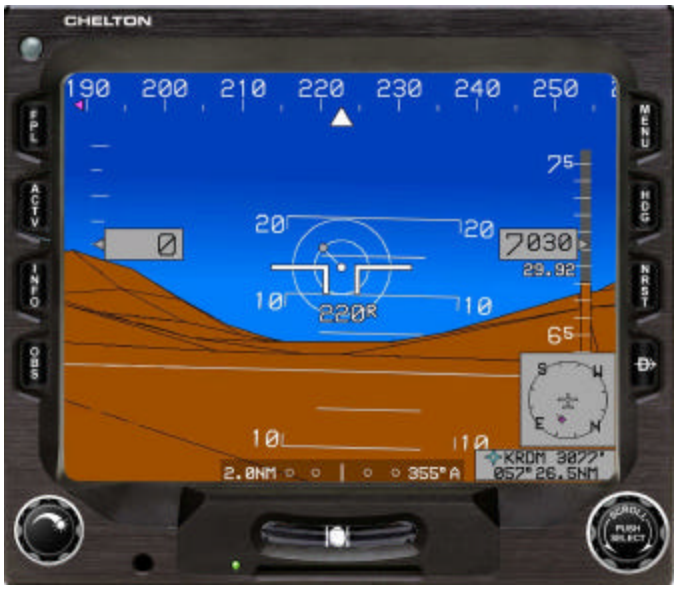

Figure 1: Primary Flight Display

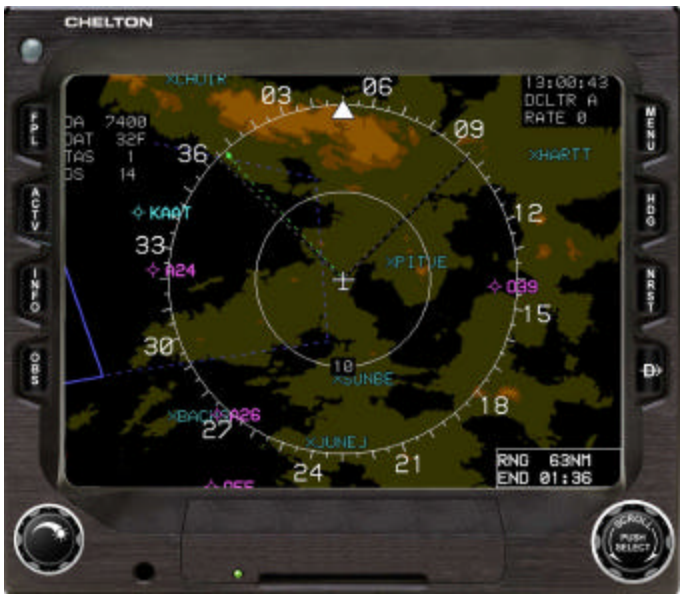

Figure 2: Multi-Function Display

HOVER VECTOR

Whenever the airspeed is below 30 kts., the flight path marker and waterline are replaced with conventional attitude bars and the hover vector. The hover vector is centered on the attitude bars and is used to indicated direction and groundspeed of drift at low airspeeds.

NOTE: The Radar Altitude is shown below the attitude bars if the aircraft has a radar altimeter. (The AGL altitude will not be visible if there is no radar altimeter input.)

The inner concentric ring indicates 15 kts ground speed (GS) and the outer concentric ring indicates 30 kts. The 30 kt ring will appear when the GS exceeds 15 kts. The white dot indicates 0 kts. The gray dot indicates the direction of drift, as viewed from above (straight up, the 12:00 position, equates to forward flight while straight down, the 6:00 position, equates to rearward flight). Groundspeed is determined by the location of the gray dot over the concentric rings.

The example below indicates the helicopter moving forward and to the left (10:00 position) at 15 kts.

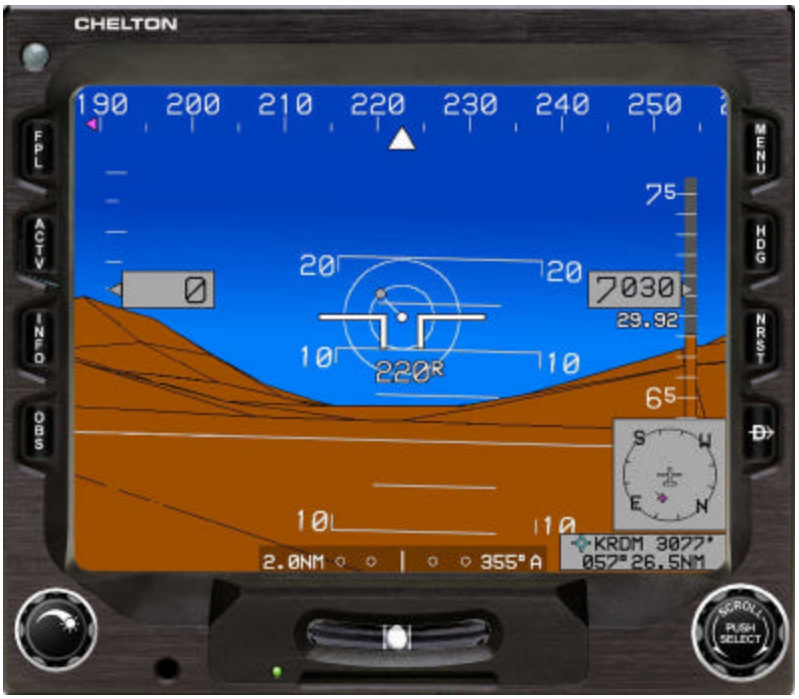

Figure 3: Hover-Vector Display

1.0 LIMITATIONS

1.1 General

A. Rotorcraft operations with the Chelton FlightLogic EFIS are limited to VFR only. IFR procedure training is allowed during VFR/VMC. Planned/deliberate flight during IMC is not authorized.

CAUTION

The Skyway will not provide guidance for terrain/obstacle clearance. If the selected approach or flight path is below the terrain, the Skyway will appear to provide flight path guidance through the terrain or obstacle.

B. The Chelton Flight System FlightLogic EFIS Pilot's Operating Guide and Reference, Document No. 150-045240, Revision C, dated 05/31/03 (or later approved revision) must be immediately available to the pilots.

C. The Chelton Flight System EFIS II must utilize software version:

Chelton IDU - Software version 4.0H-10 or later FAA approved revision

D. The aircraft is limited to maximum operating temperature of 50°C (122°F).

1.2 Terrain Warning

A. Navigation must not be predicated upon the use of the helicopter terrain awareness and warning system (HTAWS).

NOTE: The terrain and obstacle display is intended to serve as a terrain awareness tool only. It or the database may not provide either the completeness, accuracy and/or fidelity on which to base decisions and plan maneuvers to avoid terrain or obstacles.

NOTE: The obstacle data is provided by the NACO database. Towers may not be included. Power lines are not included in the database.

NOTE: The HTAWS cautions and warnings are inhibited within 2 NM of a runway included in the database. Additionally, the HTAWS will not provide aural cautions or warnings for obstacles. The HTAWS will not provide visual or aural cautions or warnings for power lines.

B. The pilot will select a range below 3 miles when the low altitude mode is activated.

C. To avoid unwanted alerts, the HTAWS must be inhibited when:
   a. Landing at a landing site that is not included in the airport database
   b. When a VFR approach to an off-airport landing site (using a user waypoint) has not been selected. (For example: Landing in a field without building a VFR approach to the site in the FMS.)

D. Mode 3 only works after initial takeoff. If subsequent takeoffs are performed without turning power off to the EFIS, Mode 3 will not arm and will not warn of a descent after takeoff.

E. Loss of GPS will result in loss of all terrain cautions, warnings, and visual depiction of terrain on the displays.

1.3 Placards

EFIS DISPLAYS APPROVED FOR VFR OPERATIONS ONLY

2.0 NORMAL PROCEDURES

2.1 Engine Prestart

EFIS Power Switch – OFF

NOTE: Low voltage during engine start and voltage spikes during generator initialization can affect EFIS durability.

2.2 Engine Starting

EFIS Power Switch – ON after Generator – ON

Verify Software Version – 4.0H-10 or later FAA approved revision

Enter Fuel – Select MENU on the ND,
Select FUEL
Select FULL
Dial in the fuel in gallons using the scroll knob.

CAUTION

The helicopter should be stationary or in stabilized flight for 45 seconds after applying power for Attitude Heading Reference System (AHRS) initialization.

2.3 In-Flight Operations

Normal operating procedures are in the Chelton Flight Systems FlightLogic EFIS Pilots Operating Guide and Reference Doc. No. 150-045240 Section 5, “Step-by-Step Procedures.”

2.4. External System Annunciators and Controls

System annunciations are detailed in the Chelton Flight Systems FlightLogic EFIS Pilots Operating Guide and Reference Doc. No. 150-045240.

A. TAWS INHIBIT ANNUNCIATOR SWITCH / TOGGLE SWITCH

The “TAWS INHIBIT” (Amber) annunciator switch, when activated, illuminates and inhibits the visual and audible TAWS alerting functions. The “TAWS INHIBIT” annunciator switch is located near the EFIS displays.

B. TAWS LOW ALTITUDE ANNUNCIATOR SWITCH / TOGGLE SWITCH

The “LOW ALT” (Amber) annunciator switch, when activated, illuminates and modifies TAWS parameters to reduce nuisance alerts during low altitude operations. The “LOW ALT” annunciator switch is located near the EFIS displays.

C. AUDIO MUTE SWITCH

The Audio Mute Switch located on the Pilot’s cyclic mutes EFIS warning voice alerts only.

3.0 EMERGENCY AND MALFUNCTION PROCEDURES

3.1 Display Annunciation Messages

The following on-screen cautions, warnings and advisories are issued by the system:

Annunciation	Cat.	Flag	Aural Annun.	Condition
Low Fuel Warning	Warning	LOW FUEL	"Fuel Low"	Calculated fuel quantity is below low fuel warning threshold of 10 gallons.
TAWS FLTA Warning	Warning	PULL UP	"Terrain, Terrain, Pull Up, Pull Up"	Within TAWS FLTA warning envelope.
Air Data Failure	Caution	NO AIR DATA	"Air Data Failure"	No valid ADC message received for more than 2 seconds
Airspeed Bug Deviation	Caution	AIRSPEED	"Airspeed"	Deviation of greater than 10KIAS from airspeed bug setting after airspeed capture.
Check Altimeter	Caution	ALTIMETER	"Check Altimeter"	Altimeter not set to 29.92" above FL180. Not activated if altimeter units are millibars/hectoPascals.
Minimum Altitude Caution	Caution	ALTITUDE	"Altitude"	Deviation below minimum altitude bug.
Target Altitude Deviation	Caution	ALTITUDE	"Altitude"	Deviation of greater than 150' from target altitude bug setting after target altitude capture.
AHRS Failure	Caution	NO ATTITUDE	"Attitude Failure"	No valid AHRS message received for more than 2 seconds.
Auxiliary Sensor	Caution	AUX SENSOR	"Auxiliary Sensor Failure"	No valid message received from installed optional sensors for more than 5 seconds. Sensor status displayed in FAULTS menu.
Check Range	Caution	CHECK RANGE	"Check Range"	Less than 100NM buffer between calculated range and distance to destination. Not activated in climbing flight.
Dead Reckoning	Caution	DR ##:##	Alert Tone	GPS/WAAS in dead reckoning mode. Timer shows time since last valid GPS/WAAS position solution to indicate quality of DR solution.
GPS/WAAS Loss of Integrity	Caution	GPS LOI	"GPS Integrity"	GPS/WAAS loss of integrity caution. Ref: RTCA/DO-229C §§ 2.2.1.6.1, 2.2.6.2, 2.2.3.6.2 and 2.2.4.6.2.
GPS/WAAS Loss of Navigation	Caution	NO GPS	"GPS Failure"	GPS/WAAS loss of navigation caution. Ref: RTCA/DO-229C §§ 2.2.1.6.2, 2.2.2.6.3, 2.2.3.6.3, and 2.2.4.6.3.
Heading Bug Deviation	Caution	HEADING	"Heading"	Deviation of greater than 10° from target heading bug setting after heading capture.

Annunciation	Cat.	Flag	Aural Annun.	Condition
IDU Overtemp	Caution	EFIS COOL	"EFIS Cooling"	IDU core temperature greater than 90°C for more than 2 seconds.
Low Fuel Caution	Caution	LOW FUEL	"Fuel Low"	Calculated fuel quantity is below low fuel caution threshold of 17 gallons.
TAWS FLTA Caution	Caution	TERRAIN	"Caution, Terrain"	Within TAWS FLTA caution envelope.
GPWS Mode 3	Caution	TOO LOW	"Too Low Terrain"	Within GPWS Mode 3 envelope.
TAWS PDA	Caution	TOO LOW	"Too Low Terrain"	Within TAWS PDA envelope.
Traffic	Caution	TRAFFIC	"Traffic"	TCAD traffic alert. Not given if below 400' AGL.
Air Data Initializing	Advisory	ADC INIT	Alert Tone	ADC not at full accuracy during warm-up
Countdown Timer Chime	Advisory	--	Alert Tone	Sounds alert tone when countdown timer reaches 00:00:00.
GPS/WAAS IFR Approach Mode	Advisory	IFR APPR	Alert Tone	GPS/WAAS in NPA mode. Ref: RTCA/DO-229C §§ 2.2.1.7 and 2.2.3.7.
Automatic Waypoint Sequencing Suspended	Advisory	SUSPEND	Alert Tone	GPS/WAAS automatic waypoint sequencing is suspended. Caused by being on final approach segment prior to arming missed approach, selecting manual GPS/WAAS OBS, or being in holding prior to activating the "CONTINUE" tile.
GPS/WAAS Terminal Mode	Advisory	TERMINAL	Alert Tone	GPS/WAAS in Terminal mode. Ref: RTCA/DO-229C §§ 2.2.1.7 and 2.2.2.7.
GPS/WAAS VFR Approach Mode	Advisory	VFR APPR	Alert Tone	GPS/WAAS in VFR approach mode (active waypoint is part of VFR approach procedure).
GPS/WAAS Vectors to Final IFR Approach Mode	Advisory	VTF IFR APPR	Alert Tone	GPS/WAAS in Vectors to Final NPA mode. Ref: RTCA/DO-229C §§ 2.2.1.7, 2.2.3.3.1, and 2.2.3.7.
Level-off	Advisory	LEVEL OFF	"Level Off"	Advisory given if magnitude of VSI is greater than 1000FPM and within 10% of VSI from target altitude. Ref: FAR § 91.219
Parallel Offset	Advisory	PTK = ##	Alert Tone	GPS/WAAS Parallel Offset path advisory. ## is nautical miles left ("L") or right ("R") of main path. Ref: RTCA/DO-229C § 2.2.1.3.16.
GPWS Mode 6	Advisory	--	"Five Hundred"	Descending through 500' AGL advisory. Armed upon climbing through 1000' AGL.

Note: The optional equipment installed will determine which annunciations are available for a particular installation.

3.2 Emergency Procedures

In the event of a failure of pilot IDU's, use the standby altimeter and GPS groundspeed to complete the current flight. Repair/replace the faulty units before further flight.

3.3 Abnormal Procedures

Failure of the GPS, AHRS or ADC, singly or in combination, adversely impacts the capabilities of the IDU. Failure of these components is annunciated visually and audibly. For "Multiple Sensor Failure" conditions refer to Chelton Pilots Operating and Reference Manual document No. 150-045240. In the event of failure, the following sections detail pilot procedures.

A. IDU FAILURE

PFD-Press the lower right hand knob on the Multifunction Display (MFD) to display the primary flight instruments on the MFD.

MFD-No procedures

B. ATTITUDE HEADING REFERENCE SYSTEM FAILURE (AHRS)

The EFIS will continue to display GPS ground track (green diamond) that may be used in lieu of heading. The white Magnetic Heading triangle will disappear from the heading tape when the AHRS heading source fails.

C. GPS FAILURE

GPS failure causes the EFIS to lose GPS updating of aircraft position, ground speed and ground track, and the ability to calculate wind information. In this failure mode, the EFIS "dead reckons" and continues to provide navigational position, groundspeed, and ground track information based upon the last known wind and current air data and heading.

NOTE: The dead reckoning mode is designed to give the pilot sufficient short-term information to allow them to transition to another navigation source or visual navigation in order to recover the aircraft. The dead reckoning mode is not designed to be used for navigation.

CAUTION

In the event of loss of GPS - Immediately revert to visual navigation and transition to other navigation sources as soon as possible. Following dead reckoning guidance can lead to large position errors.

CAUTION

Loss of GPS will result in loss of all terrain cautions, warnings, and visual depiction of terrain on the displays.

Voice Alert - "GPS failure".

Visual Alert - "NO GPS" caution flag
"DR ##:##" caution flag. ##:## is a timer to show the pilot the length of time the EFIS has been dead reckoning

Other visual indications:
ND - Navigation information in the lower right corner turns amber
Wind arrow and velocity turns amber

PFD - Highway in the sky removed after one minute
FPM turns gray after one minute

The accuracy of the dead reckoning solution depends upon how closely the actual wind matches the last known wind. It is important for the pilot to realize that, in the event of a wind mismatch, position errors will grow over time and can become large. Because of this, the dead reckoning solution is considered a short-term aid to position awareness in event of a GPS failure, and should not be used for continued navigation. The following factors should be considered in assessing the validity of the dead reckoning solution:

1. The length of time during which the EFIS has been dead reckoning. The longer the time, the greater the position error can be. As an example, with a 10 knot wind mismatch, the dead reckoning solution will be in error by 10 NM after one hour.

2. Accuracy of the last known wind computation. During normal system operation, wind is calculated during periods of relatively wings-level flight (bank < 6°). The wind calculation considers TAS, heading, GS and track. Factors

that affect these parameters can cause inaccuracies in the calculated wind. The pilot should be aware of the following potential error sources:

- o TAS: True airspeed errors can be caused by airframe induced pitot-static inaccuracies, pitot-static system leaks or blockages, and inaccurate outside air temperature readings.

- o Heading: Heading errors can be caused by poor AHRS calibration, carrying iron-bearing materials in proximity to the AHRS, and operation of electric motors or other magnetic field inducing equipment. In addition, for the wind calculation to be accurate, heading must match the vector direction of TAS. As a rule of thumb, if the aircraft is being flown out of balance, the wind calculation should be considered suspect.

- o GS: Poor satellite geometry can cause variations in the ground speed reading. Although this parameter is generally reliable, it should be considered suspect when a GPS "Loss of Integrity" exists.

- o Track: Poor satellite geometry can cause variations in the track reading. Although this parameter is generally reliable, it should be considered suspect when a GPS "Loss of Integrity" exists.

3. Atmospheric wind changes. Actual wind is rarely constant. The pilot should expect large wind changes with changes in altitude or in the presence of significant weather. The pilot should also consider the effect of surrounding terrain upon wind.

Loss of GPS also affects the accuracy of the Flight Path Marker. While the vertical component of the Flight Path Marker is unaffected by a loss of GPS, the lateral component, based upon track and GS, uses the last known wind and can be inaccurate. Unlike the dead reckoning position solution, the effects of loss of GPS on the accuracy of the Flight Path Marker are not cumulative. The Flight Path Marker remains an accurate tool for maintaining level flight during a GPS failure.

D. AIR DATA COMPUTER (ADC) FAILURE

Refer to GPS groundspeed and the backup altimeter.

4.0 PERFORMANCE

No Change.